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AUTHOR Meyer, Linda A.
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ABSTRACT

A review was conducted of the research on error detection studies completed with children, adolescents, and young adults to determine at what age children begin to detect errors in texts. The studies were grouped according to the subjects' ages. The focus of the review was on the following aspects of each study: the hypothesis that guided the work, the age of the subjects, the task demands for the subjects, the design of the study, whether subjects were alerted to upcoming problems of one sort or another in the text, outcomes, and special comments. The results suggest that little research on error detection has been conducted with beginning readers. Furthermore, since the research has been almost exclusively cross-sectional, it reveals very little about when children begin to monitor their comprehension and how their error detection ability develops. Discussion centers upon the meager evidence of children's ability to detect errors when in the early stages of reading development, the differences between listening comprehension and error detection development, and the potential impact that alerting children to upcoming problems in the text may create. A future longitudinal study should track variance in student ability, text characteristics, teacher interactions, and home influences from the time children begin reading until they are proficient readers. (Six tables are included; 73 references are attached.) (Author/PRA)

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Technical Report No. 540

A REVIEW OF RESEARCH ON ERROR DETECTION

Linda A. Meyer
University of Illinois at Urbana-Champaign

August 1991

University of Illinois at Urbana-Champaign
51 Gerty Drive
Champaign, Illinois 61820

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Abstract

A review was conducted of the research on error detection studies completed with children, adolescents, and young adults to determine at what age children begin to detect errors in texts. The studies were grouped according to the subjects' ages. The focus of the review is on the following aspects of each study: the hypothesis that guided the work, the age of the subjects, the task demands for the subjects, the design of the study, whether subjects were alerted to upcoming problems of one sort or another in the text, outcomes, and special comments. The results suggest that little research on error detection has been conducted with beginning readers. Furthermore, since the research has been almost exclusively cross-sectional, it reveals very little about when children begin to monitor their comprehension and how their error detection ability develops. Discussion centers upon the meager evidence of children's ability to detect errors when in the early stages of reading development, the differences between listening comprehension and error detection development, and the potential impact that alerting children to upcoming problems in the text may create.

A REVIEW OF RESEARCH ON ERROR DETECTION

> Comprehension as a process is an elusive entity. It is what happens to readers as they read. It is what keeps them going when they read. It involves the intuitive comment, "Oh, sure! That makes sense to me." It is what has broken down when we say to ourselves, "It's all Greek to me," or "I can't take it any longer," or when we find that we have just skimmed our eyes over two pages and realize that we have not understood one iota of those two pages . . . . However, when we get down to the bottom line, most of us would probably agree that processes are either totally or mostly inaccessible. (Pearson & Johnson, 1978, p. 5)

While most researchers would agree that comprehension is both an elusive and inaccessible process, we would also agree that tradition favors a few select ways of determining whether students have in fact comprehended a passage. The most popular means of measuring comprehension is to ask questions after students have read (Chapman, 1984). It is therefore assumed that once a person has read a selection, he or she will be able to answer questions about it. This method of assessing comprehension is used with young beginning readers and with adults alike as a form of intervention. Someone intervenes to ask questions that check the reader's understanding of the text.

Research on Comprehension Monitoring

Clay (1969) has found that young children are quite capable of monitoring their own comprehension. She suggests that traditional interventions with teachers asking questions may actually inhibit children's understanding of what they read by distracting them. She also has found that young children are able to correct themselves when they realize that what they have read does not make sense. Goodman and Burke's (1973) work on miscues supports this notion by illustrating that children's substitutions are often very suitable. In short, they often supply words they know for words they do not know.

An alternative approach to the method of using questions to measure comprehension has received considerable attention in the reading research community in the last 15 years. This approach amounts to presenting readers with text containing errors and then establishing conditions for them to respond either spontaneously to the text or alerting them to look for problems in the text.

Whereas it has been common practice to intervene with even very young readers to ask questions designed to check their understanding of what they have read, it has been assumed by many experts in the field of comprehension monitoring (e.g., Markman, 1977, 1979) that young children cannot identify errors in texts. They have suggested that the ability of readers to detect errors in texts develops only when they become adolescents.

Research on Error Detection

Research on error detection has a long tradition. Developmental psychologists working either with referential communication problems (e.g., Wykes, 1981) or with monitoring information gaps and discrepancies in oral messages (e.g., Bohannon, Warren-Leubecker, & Hepler, 1984) developed the technique of presenting either ambiguous or erroneous information to children. They then collected data on the children's "detection" of the ambiguity or error. This work has been expanded to the types of studies exemplified in this report, those pieces of research in which children of various ages read or listen to passages. In some studies, they were alerted to problems embedded in the text and in others, they had not been alerted to potential problems.

Error detection studies usually require students to listen to or to read stories or instructions and then detect problems in the text either spontaneously or after being alerted to listen for inconsistencies. One

would expect students to perform better when they have been alerted that there may be problems in a text because they know to anticipate errors. It is also possible that listening tasks may be harder for children at early stages of reading development than reading tasks would be simply because of the differences in the texts used. Generally, the texts used include problems such as directions that are inappropriately sequenced, or information that just does not "fit." In any event, the student is asked to identify the error. The purpose of this review, therefore, is to examine studies of error detection to determine when children develop the ability to monitor their comprehension. The review differs from other compilations of research on this topic to date (e.g., Haller, Child, & Walberg, 1988) because it groups studies by the ages of subjects instead of by task demands. This organization allows readers to grasp the generalizations from this work for children of different ages.

Method

Procedures

A topic search of *Psychological Abstracts* yielded 79 published studies of error detection. All of these are included in this review. Data were gathered from the studies to address these questions: What question (or questions) was the research trying to answer? What methodology was used? How old were the participants in the study? What was the nature of the task required of the subjects? What were the results of the investigation? Are there additional comments to be made about this work? The findings were recorded on tables. The author or authors of each work are listed in the first column. The year the study was published appears in the second column, with the most recent study appearing first. Frequently articles included more than one experiment. When this occurred, experiments were listed separately if the methodology varied from one experiment to the next. The age range of the subjects who participated in each study is listed in the third column. The area studied appears in column 4, and the design of each study is displayed in column five.

The sixth column reflects whether subjects were alerted that there may be inconsistencies in the text they read. Likewise, if subjects received feedback after each response, or if there was another procedure for alerting subjects about inconsistencies in the text, then that information also appears in the sixth column. The seventh column presents general descriptions of the research and the primary results of each study. The final column is for comments. These comments pertain primarily to issues raised in the discussion of the results. These issues may represent methodological questions about the entire study or some other aspect of the work. A statement of the question each study is trying to answer appears below the columns.

This organization permitted the division of the studies. The studies were then grouped into tables according to the ages of the youngest subjects. Therefore, a study involving 5-, 6-, and 7-year-olds appears in Table 1, whereas a study of 6-, 7-, and 8-year-olds appears with other reports of children in Table 2.

Results

Findings for Children Aged 6 or Younger

Summaries of 24 studies appear in Table 1. These studies were conducted between 1977 and 1984, and they represent over 30% of the studies identified. The youngest subjects ranged in age from 2 to 5 years. Most of the youngest children in the study were 5 years of age; however, there were children 6 or older in most of the groups as well. Yet despite the preponderance of children who were probably fluent beginning readers, only Gourley (1984) had the students read. All other results were based upon listening tasks rather than reading tasks. All but seven of the studies were cross-sectional. The subjects were alerted to upcoming text inconsistencies in half of the studies. Generally, results show older students performed better than younger children, although word order awareness and other measures

of language ability seemed to affect subjects' comprehension monitoring ability equally. In addition, 5-year-olds did not perform well, especially when story cohesiveness was implicit (Tunmer, Nesdale, & Pratt, 1983). First and third graders discriminated between consistent and inconsistent contexts but kindergartners did not (Ackerman, 1984).

By third grade, children responded fairly consistently when tasks required them to be able to resolve information (Ackerman, 1984). Lempers and Elrod (1983) found a sex-by-condition interaction in their listening comprehension study with 4- and 5-year-olds. Pratt and Bates (1982), as well as Robinson and Robinson (1982a, 1982b), reported improvement in 4- and 5-year-olds' ability to evaluate metacognitive messages after they had had training. In one study, Patterson, O'Brien, Kister, Carter, and Kotsonis (1981) showed first graders to be effective comprehension monitors, whereas in their second study, they found only fourth graders to monitor their listening comprehension effectively. Wykes (1981), however, found that 5-year-olds have difficulty with pronoun referents.

Despite the increasing awareness that some children enter school reading and that many schools are building reading programs for 5-year-olds, it is surprising that in 23 of the studies, only listening tasks were required of the children. The primary finding of the one study (Gourley, 1984) in which the children were expected to read, was that beginning readers were more successful at detecting errors in texts when texts met their expectations. In this study, children were not alerted to upcoming errors. It appears that these young children did better on tasks they could predict rather than on stories with less predictable events. These findings may be due in part to the fact that the children were not alerted to anticipate errors in the text. It is important to note that children in the Gourley study could identify errors in texts.

[Insert Table 1 about here.]

Findings for 6- and 7-Year-Old Children

Only 14 studies of error detection were found that involved 6- and 7-year-olds. These appear in Table 2. All of the youngest subjects in this group were just 6 years old. Over half of the studies contrasted the 6-year-olds' performances with older children and/or adults. All procedures had students listen while someone read, except Swanson and Mason's (1984) study that required students to read text. All but two of the studies were cross-sectional, and precisely half of the studies' procedures alerted students to upcoming inconsistencies. These studies show that even 6-year-olds could identify inconsistencies in texts and that strategy training generally improved performance. However, they also show that older students consistently outperformed younger students.

It is important to recognize that listening tasks dominate these studies even though children of this age are being taught to read in virtually all school settings. In fact, these children are the ages that Adams (1990) has identified as needing instructional focus on decoding *and* comprehension. Swanson and Mason's (1984) work is a clear exception to the majority of studies found for first graders. Their results suggest that new measures of reading can significantly predict end-of-first grade reading performance in addition to results from standardized tests.

It is also important to point out that Markman's (1977) work was performed with 6-, 7-, and 8-year-olds. Using *listening* tasks in all of her studies, she concluded that children are not aware of their own comprehension failure.

[Insert Table 2 about here.]

Findings for 7- and 8-Year-Old Children

Seventeen studies comprise the sample found for 7- and 8-year-old children. The youngest subjects in six of the studies were 7-years-old, the others were 8-years-old. Eight of the studies were cross-sectional and six were descriptive. The cross-sectional work generally consisted of listening tasks, although two studies conducted by Yussen, Mathews, Buss, and Kane (1980) involved reading *and* listening. The descriptive studies, on the other hand, represent a broader range of tasks. Researchers employed reading (Blaxall & Willows, 1984; Harris, Kruithof, Terwogt, & Visser, 1981; Supramaniam, 1983), listening (Wolford & Fowler, 1984), visual discrimination and memory (Wolford & Fowler, 1984), and rapid letter identification (Wolford & Fowler, 1984). Subjects were alerted to listen for inconsistencies in 11 of the 17 studies. Rather consistently, better readers detected more errors than poor readers, and, where comparisons were made in the design, older students performed better than younger students. Students of both ages read the target line more slowly than the remainder of the text in the Harris, Kruithof, Terwogt, and Visser (1981) work. Markman (1979) found that students could answer questions most easily when their answers were explicitly stated in the text. She also found that merely repeating inconsistencies did not help students improve their performance.

[Insert Table 3 about here.]

Findings for Children Aged 8 or Older

Table 4 presents summary information for studies done with children 8-years-old or older. Nineteen studies were found for this age group. Nine-year-olds and older subjects read text in 17 studies. Only two studies required students to listen as they were read to. Only one third of the work was cross-sectional. Seven of the remaining studies were experimental in design with 9-, 11-, or 12-year-olds. Subjects were alerted to possible inconsistencies in all but three of the studies.

Results generally showed that good readers are superior to poor readers at finding inconsistencies in texts. Training affected performance, particularly the performance of older students and lower performers with one exception. Strategies to activate background knowledge failed to improve students' comprehension monitoring performance. Questions raised about this stage included: How long must training time be to improve comprehension monitoring skills? and Are there generalizable gains from training in comprehension monitoring?

The Palincsar and Brown (1984) work is particularly important because it represents a careful line of research that began in a laboratory setting with researchers and moved to regular classrooms with real teachers. Furthermore, the study was conducted with 13-year-old students who could identify words adequately but who could not comprehend what they read. This type of student is prevalent in this age group (Chall, 1983). Finally, these instructional procedures appear to be exportable to whole classrooms with regular teachers when students are alerted to anticipate problems in the text and when they are taught to summarize, question, predict, and clarify as they read. The success of these methods alone is very important because it suggests that reciprocal teaching is an effective teaching technique.

[Insert Table 4 about here.]

Findings for High School Students

No studies were found for high school students.

Findings for College Students

Only five studies were found for error detection with college students. They are summarized in Table 5. Subjects read in each of these studies. Three of the five studies were experimental. Main effects were once again found for ability, and effects were often found for treatment. Treatment effects were particularly strong for immediate versus delayed reports of text inconsistencies and strategies for students to look back and re-read passages. An interesting comment on this group of studies comes from the Gambrell and Heathington (1981) work. They found that even adult poor readers perceive reading as decoding. They were not aware of general comprehension monitoring strategies, much less of how to use them. Students were alerted to anticipate problems in the text in three of the five studies, although in the Baker (1979) work they were told about confusions in the text *after* they read. Garner (1982) found that when students were given immediate feedback, they scored better on measures of comprehension. Hare (1981) reported that higher performing readers could discuss passages better than poor readers although the more difficult article that they read was a problem for all students regardless of their ability. Baker, when telling the students of problems in the text after they were finished reading, found her students unable to support their confusions. Most were unable to detect confusions about minor points in the passages, and they were least able to report confusions that stemmed from the connectives in the text. Finally, Alessi, Anderson, and Goetz (1979) found that students who were trained to look back at text, then had read to find answers, scored better on comprehension measures than students who had not been trained to look back.

[Insert Table 5 about here.]

Summary

Table 6 summarizes in descriptive form the findings for the error detection studies reviewed in this report. While the number of studies generally decreases as the age of students increases, the number of studies requiring subjects to read increases in proportion to other tasks until they represent 100% of the research for adult-age subjects. Little research required students to read before age 9.

[Insert Table 6 about here.]

It is curious that the largest number of studies found were conducted with children aged 5 or below. They represent research on listening comprehension almost exclusively. The second largest number of studies is for children aged 9-13, the adolescent age group most commonly considered to be appropriate for error detection development. Only 8 of 55 studies, conducted with children 8 or younger had them read. It therefore appears that most of what is known about children's abilities to detect errors in text comes from research on listening comprehension not reading comprehension because so little of the research involves having children read. However, the studies that have been done provide some evidence that children as young as five can detect errors as they read, as Clay (1969) predicted. More evidence is available for children aged 7 and 8. This is the age when many children become fluent readers (Chall, 1983). Therefore, they are capable of comprehending what they read because their attention can shift from figuring out the words to understanding and therefore detecting errors in text as Goodman and Burke (1973) found.

Discussion

Only 30 of the 79 studies reviewed required subjects to read, and only 8 studies were found to have students below the age of 9 years (fourth grade) read. Subsequently, the characteristics of the research reported in the area of error detection raise a number of issues.

First, to the issue of the age at which children are able to detect errors in text, the work by Gourley (1984) and Swanson and Mason (1984) suggests that young children, even those who are just learning

to read, are able to identify errors in text, especially if they have been alerted to read for problems. This is very encouraging evidence that supports Adams' (1990) conclusion that early reading instruction should focus upon word recognition and word meaning for even very young readers. It also supports Clay's (1969) hypothesis that young readers are quite capable of monitoring their own comprehension.

Second, to the issue of alerting children to problems in texts, in 46 of these 79 studies they were told that they might find problems in the materials they read. No research team executed a study that had alerting as a manipulated variable. Children were either alerted or not. Therefore, we do not know the effect that alerting alone had on performance. Future research might center upon varying the alerting condition so that we learn if children develop the ability to identify errors or confusions in text as they learn to read or if they must be alerted to look for problems in text.

Third, the most curious finding from this review of the literature is that training failed to activate background knowledge to improve 8- and 9-year-old children's error detection ability. These results are counterintuitive and contrary to the work by Anderson and his colleagues (e.g., Anderson, 1977, 1978; Anderson, Pichert, Goetz, Schallert, Stevens, & Trollip, 1976; Anderson, Pichert, & Shirey, 1983; Anderson, Reynolds, Schallert, & Goetz, 1977), which was conducted with older students. In fact, these results suggest that background knowledge activation might operate differently for readers at different stages of reading development with different kinds of text (e.g., literature *or* science). Further research is needed in this area.

Fourth, because listening tasks dominate the procedures in this area of research, we may deduce that researchers have made à priori decisions that listening comprehension performance is a proxy for reading comprehension performance. Are researchers assuming that children's listening comprehension ability predicts their later reading comprehension performance as has been found by Humphreys and Davey (1983) and Chen (1990), and that therefore it is unnecessary to conduct research on error detection when students read? Could there be another explanation for this phenomenon? The listening tasks described for children below 9 years of age in these studies appear to be far longer (and therefore more complicated) than passages children of this age group can typically be expected to read. These listening tasks usually required the experimenter to read to a child or had the children listen to a puppet present a short story. The student responded spontaneously to text inconsistencies while being read to or answered questions. Neither of these formats allows for frequent (if any) interactions between the experimenter and the child during most of the listening task. In fact, they prevent the children from signalling when they are lost or confused. In other words, the children were passive while being read to.

Therefore, these procedures are also quite different from the typical reading tasks children perform when first beginning to read. The task demands are quite different. These listening tasks may be much more difficult than age and grade appropriate reading tasks would have been. Therefore, young children might have performed better if they had been asked to read very short stories with errors embedded in them than they performed on the listening tasks.

Fifth, cross-sectional methodology dominates these studies. Therefore, all of the problems inherent in this methodology are found in much of this work. Furthermore, little descriptive data were provided in these reports. Therefore, it is not possible for readers to perform even simple re-analyses. We have learned that even 5-year-olds can detect errors in text, however, 8-year-old children are more typically presented these tasks under experimental conditions. Subsequently, we still do not know when most children *develop* the ability to detect errors in text. Older subjects predictably do better than younger subjects in these studies, but that is hardly surprising. We would expect older children to be able to perform most comprehension tasks better than younger children. Only longitudinal research would be able to inform us about when these characteristics develop.

Suggestions for Future Research

This review of the literature on error detection strongly suggests that we actually know very little about how children develop comprehension monitoring ability while reading or about how this ability changes as reading comprehension ability develops. Furthermore, we know almost nothing about how the ability to detect errors in texts is influenced by instruction and texts. These important questions could be addressed in a longitudinal study that carefully tracks variance in student ability, text characteristics, teacher interactions, and home influences from the time children begin reading until they are proficient readers. If such a study is undertaken, care should be given to develop and test a hierarchy of comprehension monitoring tasks that are age, grade, and instructionally appropriate. It is also important to consider how the instruments should be administered because it appears that administration may be as important as the texts themselves.

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Table 1

Comprehension Monitoring Studies with Children Aged 6 or Younger

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
1.	Gourley, J. W.	1984	5 & 6	Reading	Cross-Sectional/ Descriptive	No	Difficulties related to: a. connective devices b. narrative voice c. patterned repetition d. role of pictures	Beginning readers more successful when text met their expectations and when patterned repetition and pictures were related to discourse structure
	Are discourse factors sources of difficulty in texts for beginning readers?							
2.	Baker, L.	1984	5, 7, 9, & 11	Listening	Cross-Sectional/Experimental	Yes, and received feedback	Older students performed better on detecting: a. nonsense words b. internal inconsistencies c. prior knowledge variations	Overall problem–identification better than expected, 5's could identify internal inconsistency.
	Can children of different ages apply multiple standards for evaluating their understanding?							
3.	Bohannon, J. N., Warren-Leubecker, A., and Hepler, N.	1984	5, 6, & 7	Listening	Cross-Sectional/Descriptive	Yes	Children best at identifying scrambled word order in sentences also better on 2 measures of reading readiness.	
	Are children who display word order awareness better readers?							
4.	Bohannon, J. N., Warren-Leubecker, A., and Hepler, N.	1984	5, 6, & 7	Listening	Longitudinal/Descriptive	Yes	Children followed for 1 year. Those with word order awareness read about 1.3 years ahead of others.	Groups did not differ on Peabody Picture Vocab Score
	Are children who display word order awareness better readers?							
5.	Tunmer, W. E., Nesdale, A. R., & Pratt, C.	1983	5, 6, & 7	Listening	Cross-Sectional/Descriptive	Yes	Developmental differences: 5-year-olds did not perform well, especially when story cohesiveness was implicit.	
	Are there factors which may limit children's ability to recognize their failures to understand?							
6.	Pratt, M. W. & Wickens, G.	1983	5 & 7	Listening	Cross-Sectional/Experimental	Yes	Main effects for grade & perceptual support.	Children who received pictures with their short stories did better than those who did not receive pictures.
	What are the effects of age, context, and reflection-impulsivity on children's monitoring of comprehensibility problems?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
7.	Ackerman, B. P.	1984	5, 6, & 8	Listening	Cross-Sectional/Experimental	No	First and third graders had significantly higher performances on correct answers in both consistent and inconsistent assignments than kindergartners.	First and third graders, but not kindergartners, discriminated between consistent and inconsistent contexts.
	Are young children and college-age adults able to repair a comprehension problem in situations of varying repair difficulty?							
8.	Ackerman, B. P.	1984	5, 6, & 8	Listening	Cross-Sectional/Experimental	Yes	First and third graders discriminated resolving and non-resolving information. Only third graders approached true consistency of responses.	By third grade, children apparently have little difficulty repairing comprehension problems.
	Are young children and college-age adults able to repair a comprehension problem in situations of varying repair difficulty?							
9.	Lempers, J. D., & Elrod, M. M.	1983	4 & 5	Listening	Cross Sectional/Descriptive	No	Main effects for: a. age b. condition (adequate; message-dependent; situation-dependent; listener-dependent; speaker-dependent) c. sex x condition interaction	Young children's appraisal skills when listening in referential communication tasks depend in part on the source of the inadequacy.
	Do four different sources of inadequacy affect children's appraisal skills in referential communications?							
10.	Pratt, M. W., & Bates, K. R.	1982	4	Listening	Experimental	Yes	Presence of perceptual context facilitated detection of referential ambiguities.	Better message evaluators also produced more information and accurate messages.
	Are preschoolers capable of metacognitive message evaluation and its relation to message production?							
11.	Pratt, M. W., & Bates, K. R.	1982	4	Listening	Experimental	Yes	Training resulted in appropriate questioning. Training effects were maintained for 2 weeks and generalized to a new task.	Message evaluation training did not seem to benefit message production performance.
	Are preschoolers capable of metacognitive message evaluation and its relation to message production?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
12.	Robinson, E. J., & Robinson, W. P.	1982(a)	4-5	Listening	Experimental	Yes	Children who received metacognitive guidance and those who did not both improved.	Suggest we can further children's verbal skills by treating them as if understood problematic messages can cause communication failure.
	With metacognitive guidance, will children's verbal communication skills improve?							
13.	Braine, M. D. S., & Rumain, B.	1981	5-6; 7-8; 9-10; & college students	Listening	Cross-Sectional/Descriptive		All age groups perceived contradictions between imperatives with "or"; truth conditions for disjunctions; and reasoning problems with "or." But, subjects differed in ability to explain contradictions. Sensible truth judgments began to develop around age 7.	Children appear to understand "or" at younger ages than previously reported in the literature.
	With improved testing methodology, will students of even young age be able to comprehend the various usages of "or?"							
14.	Patterson, C. J., O'Brien, C., Kister, M. C., Carter, D. B., & Kotsonis, M. E.	1981	5, 7, & 9	Listening	Cross-Sectional/Experimental	No	Complexity of stimulus and degree of message ambiguity affected children's performance. Only fourth graders showed effective comprehension monitoring.	
	Can young children show evidence of comprehension monitoring?							
15.	Patterson, C. J., O'Brien, C., Kister, M. C., Carter, D. B., & Kotsonis, M. E.	1981	5 & 6	Listening	Cross-Sectional/Experimental	No	First graders showed considerable proficiency with comprehension monitoring.	Task complexity significantly affected student performance. Compare procedures and results from these two Patterson et al. experiments.
	Can young children show evidence of comprehension monitoring?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
16.	Flavell, J. H., Speer, J. R., Green, F. L., & August, D. L.	1981	5 & 7	Listening	Cross-Sectional/Descriptive	No	Older students showed more spontaneous verbal and non verbal signs that they had detected inadequate instructions, and made comments or comparisons about the directions they had been given.	Could kindergartners remember the instructions long enough to complete the task?
	Can more information be gained about "the child's developing metacommunicative understanding" and comprehension-monitoring abilities?							
17.	Flavell, J. H., Speer, J. R., Green, F. L., & August, D. L.	1981	5 & 7	Listening	Cross-Sectional/Descriptive	No, but students were given immediate feedback.	Kindergartners demonstrated they could remember instructions required to complete the task.	Do a number of processes contribute to young children's difficulty completing a following direction task?
	Can more information be gained about "the child's developing metacommunicative understanding" and comprehension-monitoring abilities?							
18.	Pickert, S. M.	1981	5, 7, & 9	Listening	Cross-Sectional/Descriptive	No	Ambiguous messages were more difficult for all children than precise messages, but there were no significant differences at any grade level between explicit and implicit messages.	Questions posed are about the general development of children's reasoning ability.
	When do children first distinguish ambiguous from precise messages and when can they resolve the ambiguity through additional questioning? Are implicit messages more difficult to identify than explicit ones?							
19.	Singer, J. B., & Flavell, J. H.	1981	5 & 7	Listening	Cross-Sectional/Descriptive	Yes	Main effects for grade, and condition, and a significant grade by condition interaction. Conditions were: a. unambiguous b. no closure c. closure	Young children influenced by listener's and speaker's behavior. Do children develop sense that ambiguous messages are unclear, regardless of responses?
	Do young children understand that referentially ambiguous messages imply message inadequacy?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
20.	Wykes, T.	1981	5	Listening	Descriptive	No	Children had problems with sentences having more than one pronoun. They had particular problems when they had to draw inferences.	Could children remember noun, or can they store it if they don't have to process it much?
	Do 5 year olds have difficulty in determining the reference of anaphoric pronouns?							
21.	Wykes, T.	1981	5	Listening	Descriptive	No	Children remembered noun but could not carry out the inference.	Did these children use a syntactically oriented rule, or what else might explain their inability to draw the appropriate reference?
	Do 5-year-olds have difficulty in determining the reference of anaphoric pronouns?							
22.	Emerson, H. F., & Gekoski, W. L.	1980	2, 9-11, & 11	Listening	Cross-Sectional/Descriptive	No	Main effects for comprehension by age 8, recognition and synonymy by age 10. Intelligence predicted more than 25% of the variance.	Comprehension of "because" and "if" appears to develop slowly as students learn various language rules.
	How does one characterize the knowledge that what follows "because" or "if" in a sentence is the first-occurring event in time, and that this is independent of the position of the clause in the sentence?							
23.	Meissner, J. A.	1978	5 & 7	Listening	Cross-Sectional/Descriptive	No	Second graders were better at verbalizing concepts and evaluating messages but worse at detecting their own poor messages than kindergartners.	Kindergartners appear to have substantial skill at stimulus comparison tasks.
	Are young children (kindergartners) capable of stimulus comparison tasks?							
24.	Bearison, D. J., & Levey, L. M.	1977	5, 7, & 9	Listening	Cross-Sectional/Descriptive	No	As groups got older, they were better able to distinguish between ambiguous and unambiguous messages, and response latencies decreased.	
	Are children able to decode ambiguous and unambiguous verbal messages using standardized procedures?							

Table 2

Comprehension Monitoring Studies with 6 and 7 Year Olds

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
1.	Swanson, B., & Mason, J. E.	1984	6	Reading	Descriptive	No	Three recently developed tests of early reading: a. limits of print test b. Mow-Motorcycles Test c. Mickish Word Boundary Test were found to be benchmark measures of early reading.	The Language Awareness in Reading Readiness Test made a significant addition to predictions from standardized test scores.
	Can recently developed test (N=6) predict end of first grade reading achievement?							
2.	Kurtz, B. E., & Borkowski, J. G.	1984	6 & 8	Listening	Cross-Sectional/Experimental	Yes/No Depending upon treatment	Strategy training found highly successful. Students receiving metacognitive training did perform significantly better than their control group.	Children with high scores in meta-memory appeared to gain more from the total training program than other students.
	Does meta-memorial knowledge influence strategic behavior on a variety of memory tasks?							
3.	Ackerman, B. P.	1984	6, 10, & adults	Listening	Cross-Sectional/Experimental	No	Main effects found for: a. all grades - complexity influenced performance. b. no interaction for 2 oldest groups for contiguity and temporal location complexity. c. adults had effects for complexity increment independent of contiguity. d. 10-year-olds showed interaction of resolution of processing and contiguity storage variables. e. 6 year olds - processing increments interacted with the storage increment both separately and with each other.	No developmental differences in problem detection.
	Are young children and college adults able to repair a comprehension problem in situations of varying repair difficulty?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
4.	Ackerman, B. P.	1984	6, 10, & adults	Listening	Cross-Sectional/Experimental	Yes	Training most influential with 10 year olds and adults on resolution questions in consistent and inconsistent contexts.	First graders did not change as a result of instruction.
	Are young children and college adults able to repair a comprehension problem in situations of varying repair difficulty?							
5.	Pratt, M. W., & Wickens, G.	1983	6	Listening	Experimental	Yes	Main effect significant for perceptual support.	If children lack external markers will they fail to scan for internal representations?
	Do cognitive style, context, and problem type affect text comprehension?							
6.	Pratt, M. W., & Wickens, G.	1983	6, 9, & 12	Listening	Cross-Sectional/Descriptive	Yes	Significant effects for: a. grade b. problem type (theme absence readily detected, referential ambiguity harder to detect) c. grade by problem-type	Manipulation of learner purpose failed to show predicted effects.
	Do cognitive style, context, and problem type affect text comprehension?							
7.	Ackerman, B. P.	1983	6, 8, & adults	Listening	Cross-Sectional/Experimental	No	Evaluation of the literal form and inference to the speaker's intended use of an utterance are independent components of comprehension.	Information in text and tone of reader seem to influence listeners differently.
	Do children understand the relation between literal form and illocutionary function in interpreting ironic utterances?							
8.	Ackerman, B. P.	1983	6, 8, & adults	Listening	Cross-Sectional/Experimental	No	Intensified utterances (e.g., <u>really</u>) affected only the performance of third graders.	Even first graders understand ironic utterances.
	Do children understand the relation between literal form and illocutionary function in interpreting ironic utterances?							
9.	Ackerman, B. P.	1982(a)	6, 8, & adults	Listening	Cross-Sectional/Descriptive	No	6-year-olds often identified inconsistent events, though they failed to discriminate between relevant and irrelevant information.	Paragraph type was the most powerful influence on student performance. Did first graders perceive the events less extremely than the 8-year-olds and adults?
	Do young children generate contextual expectations from story information to resolve comprehension failures?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
10.	Ackerman, B. P.	1982(b)	6, 8, 10, & adults	Listening	Cross-Sectional/Descriptive	No	The older the subject, the better they did on idiomatic interpretations of idioms and changed-form items when read to.	Young children were sensitive to, but could not explain idioms in some situations.
	Do children comprehend common idioms and if so, how do they do so?							
11.	Ackerman, B. P.	1981	6, 9, & adults	Listening	Cross-Sectional/Descriptive	No	First and fourth graders discriminated between ambiguous and unambiguous information. Only fourth graders and adults correctly evaluated both types of stories.	Did adults infer in situations where other subjects did not?
	Can young children determine the deictic adequacy of communications?							
12.	Ackerman, B. P.	1981	6, 9, & adults	Listening	Cross-Sectional/Descriptive	Yes	Subjects in all grades discriminated ambiguous and unambiguous statements.	Do subjects have more trouble identifying evaluating information when they must integrate details?
	Can young children determine the deictic adequacy of communications?							
13.	Markman, E. M.	1977	6, 7, & 8	Listening	Cross-Sectional/Descriptive	Yes	Main effect for grade significant for scores on magic and game items.	Are young children processing information at a relatively superficial level?
	Are young children aware of their own comprehension failure?							
14.	Markman, E. M.	1977	6, 7, & 8	Listening	Cross-Sectional/Experimental	Yes, within a demonstration	Main effect for grade on magic and game items.	First graders showed little evidence of knowing they had faulty comprehension.
	Are young children aware of their own comprehension failure?							

Table 3

Comprehension Monitoring Studies with Children 8 or Above

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
1.	Blaxall, J., & Willows, D. M.	1984	7	Reading	Descriptive	No	Children made more graphically similar errors as text became more difficult. Significant interaction between reading ability and difficulty level. Low performers' errors changed less than errors of medium or high performers.	Do high and medium performers have more flexible strategies?
	Do reading ability and text difficulty have any effect on three types of oral substitution errors made by beginning readers?							
2.	Wolford, G., & Fowler, C. A.	1984	8	Listening	Descriptive	Yes	Main affects for task and reader classification (good readers performed better), but non-significant results for interaction between task and reader classification.	Poor readers' deficient use of phonetic characteristics of letter names no worse or different from graphic characteristics of letter forms.
	Do good and poor readers perform differently with partial information?							
3.	Wolford, G., & Fowler, C. A.	1984	8	Visual discrimination and memory @ Chinese characters	Descriptive	Yes	Significant effects for foil type (Chinese characters - similar or dissimilar) and reading group (high or low performers).	Why do good readers make more false alarms to related, rather than neutral foils when poor readers do not?
	Do good and poor readers perform differently with partial information?							
4.	Wolford, G., & Fowler, C. A.	1984	8	Rapid single-letter identification	Descriptive	Yes	Reader classification, letter-type, and interaction of letter-type and reader classification were all significant.	Good and poor readers differed on letter parts but not on whole letters.
	Do good and poor readers perform differently with partial information?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
5.	Lodico, M. G., Ghatala, E. S., Levin, J. R., Pressley, M., & Bell, J. A.	1983	7	Listening/Game format	Experimental	Yes	Trained and untrained students could assess when they remembered "better." Larger numbers of trained students claimed their strategies accounted for their performance.	Instruction in general memory-monitoring may change strategy use.
	Does training children about the general principles of strategy monitoring influence subsequent strategy choice?							
6.	Supramaniam, S.	1983	7	Reading	Descriptive	Yes	During proofreading task, poor readers failed to identify as many misspellings as good readers though they performed similarly on spelling tests of the same words.	Predictably, word length influenced both groups' performance with errors apparently more difficult to detect in long words than short words.
	Are good readers better proofreaders than poor readers?							
7.	Townsend, M. A. R.	1983	8 & 11	Listening	Cross-Sectional/Experimental	Yes	Stories shifted requiring students to change schema while listening. younger children were less proficient at spontaneously shifting schema in ambiguous passages.	Older and younger children had difficulty making an uncued shift, therefore supporting the notion of this as a difficult task.
	Do younger children evidence inadequate monitoring of the prose-schema interaction?							
8.	Townsend, M. A. R.	1982	8	Listening	Experimental	Yes	Good readers recalled more information, but good and poor readers shifted schemata equally well when necessary as they listened to an ambiguous passage.	This study produced findings counter to frequently espoused theories as well as some studies suggesting reader ability for general comprehension and schema shifting will be similar.
	Do good and poor readers show similar facility in shifting between familiar schemata in a listening comprehension task?							
9.	Harris, P. L., Kruithof, A., Terwogt, M. M., & Visser, T.	1981	8 & 11	Reading	Experimental	Yes	Students of both ages read the target line more slowly than they read the remainder of the story. Older students were better at picking out the inappropriate line.	Did alerting alter results since students then searched to find an anomaly?
	Does age difference affect children's sensitivity to textual anomaly?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
10.	Harris, P. L., Kruithof, A., Terwogt, M. M., & Visser, T.	1981	8 & 11	Reading	Descriptive	Yes	Main effect for age and title. Both groups slowed on passage with inappropriate title. Interaction of age and title are far from significant.	Did the larger number of subjects in this study effect the results for these experiments?
	Does age difference affect children's sensitivity to textual anomaly?							
11.	Yussen, S. R., Mathews, S. R., Buss, R. R., & Kane, P. T.	1980	7, 9, 10, 11, & adults	Listening and reading for all subjects except adults. Adults read only.	Cross-Sectional/Descriptive	No	The older the subject, the greater the probability that they could identify initiating events, actions, and consequences as the most important elements of the story. Ratings of important story features did not shift between ages.	Greatest shift seen between second and fourth grade.
	Does awareness of prose coherence increase with children's age?							
12.	Yussen, S. R., Mathews, S. R., Buss, R. R., & Kane, P. T.	1980	8 & 11	Listening and reading	Cross-Sectional/Descriptive	No	The older students consistently chose key elements to describe a story. Recall was higher for key elements and there were marginal grade effects. While older children remembered more, the differences were not significant.	Younger children have more variable performance, and study supports the need to phrase questions carefully.
	Does awareness of prose coherence increase with children's age?							
13.	Kotsonis, M. E., & Patterson, C. J.	1980	7, 8, 9, & 10	Listening	Cross-Sectional/Descriptive	No	Learning disabled and normal children of each age participated with game-like task. No age effects were found, but learning disabled students at each age performed below normal children on comprehension monitoring.	Learning disabled students simply seem to be less sensitive to the information they receive.
	Are LD children deficient in the development of comprehension-monitoring skills?							
14.	Danner, F. W., & Mathews, S. R.	1980	7 & 11	Reading	Cross-Sectional/Descriptive	No	Young children made inferences as they read, but we do not know the extent to which children make use of their inferences with recall.	Young children lack planfulness and use of learning strategies.
	Do children make inferences while they read?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
15.	Markman, E. M.	1979	8, 10, & 11	Listening	Cross-Sectional/Experimental	Yes	Implicit condition significantly more difficult than the explicit condition. Almost half of the children missed almost all of the items in the explicit condition as well.	What are the efforts of memory; limited logical capacity; assumptions; and demand characteristics?
	Are children aware of their own comprehension failure when they are presented with inconsistent information?							
16.	Markman, E. M.	1979	8 & 12	Listening	Cross-Sectional/Experimental	No	One condition required children to repeat inconsistencies - no result effected by this increased attention. Most third graders did not notice the problems in the text.	Suggests that keeping sentences in memory does not guarantee comprehension.
	Are children aware of their own comprehension failure when they are presented with inconsistent information?							
17.	Markman, E. M.	1979	8 & 12	Listening	Cross-Sectional/Experimental	Yes	Replicated results of Study #15. 81% students in implicit condition missed all, or all but one problem. 50% of the students also missed problems in the explicit condition.	Children receiving instruction performed better than those who did not receive instruction.
	Are children aware of their own comprehension failure when they are presented with inconsistent information?							

Table 4

Comprehension Monitoring Studies with High School Students

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
1.	Short, E. J., & Ryan, E. B.	1984	9	Reading	Experimental	Yes	Results presented for skilled and unskilled readers. Strategy training for comprehension produced dramatic gains. Only children receiving attribution training alone showed poorer performance than skilled readers.	Are there generalizable gains possible from metacognitive strategy training?
	Does story grammar strategy and attribution training eliminate or minimize comprehension differences between skilled and less skilled readers?							
2.	Grabe, M., & Mann, S.	1984	9, 10, & adults	Reading	Cross-Sectional/Experimental	Yes	Significant differences in monitoring skills by ability. Training produced significant changes in monitoring ability, though only with consistent passages, and not with inconsistent passages.	Might longer training times and/or more direct instruction in monitoring improve students' performance on inconsistent passages?
	Does comprehension monitoring skill differ among readers and can training improve this skill?							
3.	Scardamalia, M., Bereiter, C., & Steinbach, R.	1984	11	Writing	Experimental	Yes	Instruction included thinking aloud to stimulate self-questioning and instruction in working with conflicting ideas. Training produced increased reflective statements.	Informal observation also showed students seemed to enjoy planning and appeared to increase their monitoring, analysis, recognition of problems, and understanding of planning cues.
	Can elementary school children be enabled to sustain reflective processes in composition independently?							
4.	Ramsel, D., & Grabe, M.	1983	9, 11, & adults	Reading	Cross-Sectional/Experimental	Yes	The two conditions were to read carefully or to answer previously memorized questions. All age groups with questions spent more time, but only 11-year-olds and adults recalled more information.	Is age change necessarily similar to changes from those achieved with strategy training?
	Do age differences among readers affect viewing time and recall of relevant information in goal-directed reading?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
5.	Baker, L.	1983	9 & 11	Reading	Cross-Sectional/Experimental	Yes	Passages included nonsense words, prior knowledge violations, and internal consistencies. After training, students still differed by age in their ability to use standards. Better readers were superior to poorer readers.	Children differed in their ability to determine what they understand, and what they had been taught.
	Do age, reading proficiency, and type of standard affect spontaneous versus instructed use of multiple standards in evaluating comprehension?							
6.	Taylor, M. B., & Williams, J. P.	1983	9 & 11 (LD & normal)	Listening	Cross-Sectional/Experimental	Yes	Learning-disabled and normal readers produced similar results for choosing titles and producing summary sentences for passages.	
	Are LD readers able to comprehend and use the main idea as well as normal readers?							
7.	Taylor, M. B. & Williams, J. P.	1983	9 & 11 (LD & normal)	Reading with Listening	Cross-Sectional/Experimental	Yes	LD readers in a reading and listening condition scored better when detecting deviant sentences than either normal or LD readers when reading only. The type and position of sentence affected groups similarly.	Study looked at text structure and students' ability to comprehend written text.
	Are LD readers able to comprehend and use the main idea as well as normal readers?							
8.	Hansen, J., & Pearson, P. D.	1983	9	Reading	Experimental	Yes	Poor, but not good, readers benefitted from instruction in: a. raising students' awareness of importance of drawing inferences from text information and background knowledge. b. getting students to discuss background knowledge and then predict what they'll find in the text. c. practicing responding with numerous inferential questions.	How might these procedures be incorporated into routine classroom practices?
	Can instructional methodology improve the inferential comprehension of good and poor readers in the fourth grade?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
9.	Reis, R., & Spekman, N. J.	1983	12	Reading	Descriptive	Yes	Students detected reader-based inconsistencies more frequently than text-based inconsistencies.	
	Do comprehension monitoring skills improve with training among middle-grade poor comprehenders?							
10.	Reis, R., & Spekman, N. J.	1983	12	Reading	Experimental	Yes	Direct instruction for training group resulted in higher performance on reader-based but not text-based inconsistencies.	Would longer training change text-based outcomes?
	Do comprehension monitoring skills improve with training among middle-grade poor comprehenders?							
11.	Hess, A. M.	1982	9 & 11	Reading	Cross-Sectional/Descriptive	No	Battery of tests showed poor and good comprehenders to differ in semantic processing and for processing speed.	Might remediation focus on increasing decoding speed and direct instruction in comprehension?
	Do semantic processing and speed of processing contribute to specific learning disabilities in reading comprehension?							
12.	Carr, E. M., Dewitz, P., & Patberg, J. P.	1983	11	Reading	Experimental	Yes	Training on: a. structured overview to activate background knowledge. b. cloze procedure to enhance inferential comprehension. c. self-monitoring checklist produced differences for students in treatment groups for inferential comprehension - immediate and delayed transfer.	What would results be if control group received some treatment to increase ecological validity of the procedures?
	Does inferential reading training improve children's comprehension of expository text?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
13.	Winograd, P., & Johnston, P.	1982	11	Reading	Experimental	Yes	Poor readers were taught to activate background knowledge as a strategy to increase probability of error detection. Results did not support treatment, and many students (good and poor readers) failed to detect errors.	Questions raised generally about the error detection paradigm.
	Do error detection abilities improve for poor readers when they are given assistance in selecting appropriate schemata?							
14.	Garner, R., & Anderson, J.	1982	11	Reading	Experimental	Yes	Treatment effects were not found for poor readers in error detection after activating background knowledge to increase error detection.	A replication of Winograd & Johnson
	Does pre-reading direction explicitness affect error detection abilities and does methodology have an impact on this investigation?							
15.	Owings, R. A., Petersen, G. A., Bransford, J. D., Morris, C. D., & Stein, B. S.	1980	10	Reading	Descriptive	No	Successful and unsuccessful fifth grade readers were compared reading consistent and inconsistent stories. Scores were higher for consistent stories, and successful readers spontaneously monitored themselves to regulate their reading.	Many students perform less well than they might. Why assume students must develop these skills spontaneously?
	Does the ability to spontaneously monitor and regulate learning characterize the differences between successful and less successful fifth grade readers?							
16.	Garner, R.	1980	12 & 13	Reading	Descriptive	Yes	Good and poor readers read consistent and inconsistent expository passages. Main effects found for: a. reader (good vs. poor) b. material (consistent) c. segment (unaltered easier) as well as reader by d. material e. segment f. material by segment g. reader by material by segment	Good readers noticed the problems in the passages and poor readers did not.
	Does monitoring skill differ between good readers and poor readers?							

	Author(s)	Year	Subjects' Ages	Area	Design	Alerted	Description and Outcome(s)	Comments
4.	Baker, L.	1979	18+	Reading	Descriptive	Yes-after the fact	Subjects were told about text confusions and outcomes <u>after</u> they read. Primary findings were: a. failure to support large proportion of confusions. b. confusions of main points were detected most frequently. c. confusions of inconsistent information and unclear references reported more often than inappropriate connectives.	Readers impose sense in numerous ways. Subjects often resolved inconsistencies without realizing they had done so. Subjects' purposes for reading were often not compatible with task demands.
	Does the <u>type</u> of text confusion affect comprehension monitoring and does the <u>level</u> of text confusion affect comprehension monitoring?							
5.	Alessi, S. M., Anderson, T. H., & Goetz, E. T.	1979	18+	Reading	Experimental	No	Half of the students were branched to "look back" to simulate studying behavior. Those students scored better on comprehension measures.	Does training in natural "look-backs" hold promise to improve students studying?
	Does the absence of prerequisite knowledge cause subsequent problems in comprehension?							

Table 6

Summary of Research in Reading for Comprehension Monitoring with Subjects from Early Childhood through Adulthood

Subjects' Ages	Number of Total Studies	Studies on Reading
0-5	24	1
6-7	14	1
7-8	17	6
9-13	19	17
14-18	0	0
18+	5	5